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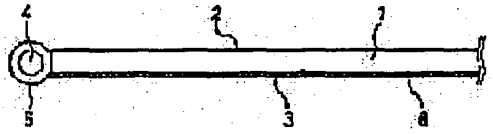
(54) BACK LIGHT

(57)Abstract:
PURPOSE: To obtain sufficient brightness and to enable a back light to be used as a high-performance machine whose power consumption-brightness converting efficiency is high with respect to a normal line direction drawn down to at least a light emitting surface.
CONSTITUTION: This is the edge-light type back light obtained by partially covering one wide surface of a light transmission plate 1 consisting of a translucent material with a light diffusing matter 6 and covering the surface with a light diffusing and reflecting plate 3. On the light emitting surface side of the plate 1, a film 2 whose light emitting surface is rougher than a light incident surface (light guiding plate side) and which increases the brightness of light emitted from the light emitting surface of the plate 1 when it is arranged on the side of the light emitting surface of the plate 1 is arranged.



[Claim]

[Claim 1] Cover partially the optical diffusate which has a refractive-index value below the optical refractive index of the light guide plate quality of the material in one large field of the light guide plate which consists of a translucency material, or an optical diffusion function is performed to this field. In the back light for panels which has the light source the field -- a mirror plane or an optical diffuse reflection plate -- covering -- the line of the aforementioned light guide plate which approached the 1 side-face edge at least at this -- The back light for panels which arranged the film with which the Idemitsu side of at least one sheet becomes the Idemitsu side side of a light guide plate from the translucency material of a split face rather than ON **** (light guide plate side).

[Claim 2] The back light for panels of the claim 1 publication using the film to which it is made to increase when the front face by the side of the Idemitsu side of the film which consists of a translucency material is a split face, and allots this to the Idemitsu side side of a light guide plate and it measures from [from which the brightness of the light which comes from the Idemitsu side of a light guide plate was substantially taken down to the Idemitsu side side of the aforementioned film] a normal from the front face by the side of ON **** (light guide plate side).

[Claim 3] The claim 1 using the film of the domain whose distance of the level difference of concave and a convex, the adjacent concave and concave or a convex, and a convex is 10 micrometers - 1000 micrometers when the status of the split face of the Idemitsu side of the film which consists of a translucency material consists of the concavo-convex status and observes the field under a microscope 100 times the scale factor of this, or the back light for panels given in two.

[Detailed description]

[0001]

[Field of the Invention] this invention relates to the back light for panels which irradiates a penetrated type or a half-transparency type panel from a tooth back.

[0002]

[Prior art] Recently, the LCD which moreover has a legible back light device with a thin shape as display, such as a word processor of a laptop type or a

book mold and a computer, is used. it is shown in such a back light at drawing 1 -- as -- the end section of the light guide plate of a translucency -- a line like a fluorescence spool -- the edge light formula which puts the light source side by side is used well In the case of this edge light formula, as shown in drawing 2 , the optical diffusate with a refractive index larger than this light guide plate material is partially covered to one field of a light guide plate, and there are many things of the field arranged so that the whole surface may be mostly worn with a specular reflection plate or an optical diffuse reflection plate.

[0003] recently, the dc-battery drive especially of the back light comes to be carried out, and much more enhancement in a power consumption-brightness conversion efficiency wishes -- having -- getting down -- a line -- arranging the light source for the reflecting plate with a high reflection factor on a wrap light-reflex machine, or allotting the reflecting plate with a high reflection factor to the field which covered the optical diffusate of a light guide plate partially is proposed

[0004] However, also in the technique of **** to describe above, although a power consumption-brightness conversion efficiency improves, enhancement that it is not yet enough and further more much more is desired.

[0005]

[Object of the Invention] The purpose of this invention has a high power consumption-brightness conversion efficiency, and it is in offering the back light from which high brightness is obtained.

[0006]

[The means for solving a technical problem] this invention person etc. sets to the back light of an edge light formula, as a result of performing various studies per above-mentioned point. If the film with which the Idemitsu side of at least one sheet turns into the Idemitsu side of a light guide plate from the translucency material of a split face rather than ON **** (light guide plate side) is arranged It found out the luminous-intensity-distribution property of a back light changing, and the directivity of the light to the orientation of a normal taken down to the Idemitsu side becoming stronger, and becoming the high back light of the power consumption-brightness conversion efficiency described above to the orientation of a normal substantially taken down to the Idemitsu side.

[0007] Namely, this invention covers partially the optical diffusate which has a refractive-index value below the optical refractive index of this light guide plate material in one large field of the light guide plate which consists of a translucency material. Or perform an optical diffusion function to this field, and the field is worn with a mirror plane or an optical diffuse reflection plate. In the back light for panels which has the light source the line of the aforementioned light guide plate which approached the 1 side-face edge at least at this -- It is related with the back light for panels which arranged the film with which the Idemitsu side of at least one sheet becomes the Idemitsu side side of a light guide plate from the translucency material of a split face rather than ON **** (light guide plate side).

[0008] Next, this invention is further explained in full detail based on a drawing.

[0009] Drawing 1 is the perspective diagram of one embodiment of this invention, and drawing 2 is drawing showing an example of the back light of an edge light formula. One in drawing is the nature of a quartz, glass, and a translucency, or synthetic resin, for example, an acrylic resin etc., that to be a light guide plate and what is necessary is just the matter which passes light efficiently. Directivity to the orientation of a normal from which 2 changed the luminous-intensity-distribution property of the light which is the film with which the Idemitsu side consists of a translucency material of a split face rather than ON **** (light guide plate side), and acted as Idemitsu from the surface of light-guard plate, and took it down to the Idemitsu side is strengthened more. this invention -- this film -- one sheet -- or although two or more sheets are used, sheets [two or more], for example, when two sheets are used, brightness improves further, so that the example of this invention may also show

[0010] It is the characteristic feature that this invention arranges the film with which the above-mentioned Idemitsu side turns into the Idemitsu side of a light guide plate from the translucency material of a split face rather than ON **** (light guide plate side).

[0011] If the aforementioned conditions in this invention are explained further in full detail, as for the above mentioned film (2 in drawing), the Idemitsu side will consist of a translucency material of a split face rather than ON **** (light guide plate side), and especially the quality of the

material will not be limited that the quality of the material should just be translucency materials, such as an acrylic, a polycarbonate, and glass. moreover, the metal mold according [especially the split-face formation technique at the time of making the Idemitsu side into a split face is not limited, and] to embossing, a blast-cleaning manipulation, and a heat press -- although it does not consider as a split face by technique, such as a molding manipulation and a chemical treatment, and especially ON **** (light guide plate side) does not need to be conscious and it is not necessary to make it into a split face, what is necessary is just in the status that the aforementioned Idemitsu side turns into a split face from ON **** (light guide plate

[0012] The status become the aforementioned split face in this invention is JIS. It can judge from a ten point average of roughness height, a center line average of roughness height, etc. which are said by this convention as a result of measuring by the technique specified to B0601.

[0013] Especially the status of the split face by the side of the Idemitsu side of the film which consists of a translucency material used in this invention is not limited, and does not need to make the configuration regular especially again. However, the near standard is in the status with desirable it being the domain whose distance of the level difference of the concave and the convex which the orientation of a normal which the field is constituted from the concavo-convex status, and was taken down to the Idemitsu side adjoined or the Idemitsu side, the horizontal adjacent concave, concave or a convex, and a convex is 10 micrometers - 1000 micrometers, when the split-face status by the side of the Idemitsu side of the aforementioned film is observed under a microscope 100 times the scale factor of this. When another representation explains further the status of the split face by the side of the Idemitsu side of the aforementioned film used by this invention, in the arbitrary cross sections of this film, the Idemitsu side side consists of a triangular weight-like configuration where the shape of the convex gestalt, the shape of for example, prism, or a convex lens was similar, and the vertical angle of the configuration is 80 - 150 degrees preferably 40 to 170 degrees.

[0014] Since contrast becomes low so that the angle which ****s from [from which the liquid crystal display was taken down to the screen] a normal becomes large, the brightness near [aforementioned] the orientation of a

normal is thought as important practically. If the Idemitsu side side arranges the film which is a split face on the Idemitsu side of a light guide plate from an ON **** side as described above, the brightness of the light which acts as Idemitsu from a light guide plate will be amplified, and the directivity of light will be more strengthened with this invention. Namely, when the brightness of the light which acted as Idemitsu from the field in the orientation of a normal substantially taken down to the Idemitsu side is measured and there is nothing **** about the aforementioned film, or when the Idemitsu side side arranges the film which is not a split face from an ON **** side, it compares. That brightness is amplified, the angle to which the normal taken down to the aforementioned Idemitsu side is received, For example, it turns out that the above mentioned directivity of light is more strengthened from what the decrement rate serves as size from brightness when the brightness similarly measured from the orientation of 60 degrees ** measures in the orientation of a normal substantially for (for example, it decreases to about 50 - 60% of the brightness when measuring in the orientation of a normal). In addition, the luminance meter used here is a luminance meter of marketing usually used generally.

[0015] Moreover, you may arrange an optical diffusion plate between the aforementioned film and the aforementioned light guide plate if needed so that the pattern of the shape of a dot of the optical diffusate (6 in drawing) of the shape of a dot printed on the surface of light-guard plate mentioned later cannot discriminate in human being's eye and may become.

[0016] The optical diffusate given to a light guide plate is coating, printing ink, etc. with which it was equal, or it had a parvus refractive index, and the diffuse reflection factor contained the large pigment, for example, a silica, and the barium sulfate as compared with the quality of the material of a light guide plate. These are printed in the shape of a dot on a surface of light-guard plate by technique, such as screen-stencil. Furthermore, what carried out opening a direct stoma on the surface of a light guide plate etc., and performed the optical diffusion function is used. the field of the light guide plate with which the mirror plane or the optical diffuse reflection plate (3 in drawing) covered the optical diffusate -- almost -- the whole surface -- a wrap -- it arranges like 4 -- a line -- the light-reflex machine 5 which is the light source and has a clearance (slit) for light carrying out ON light to the

edge of a light guide plate as a desirable mode -- it is -- a line -- where the light source side of the light source and the clearance of a certain width of face are given, it covers -- having -- **** -- a light guide plate -- it is installed so that the 1 end-face section may be approached at least and the medial axis may become almost parallel to the end face of a light guide plate

[0017] the above -- a line -- although the light source has a fluorescence spool, a tungsten incandescence spool, an optical rod, the object that arranged Light Emitting Diode, a fluorescence spool is desirable and it is desirable that the length of the uniform photogenesis section excluding the polar zone from the field of power saving is equal to the length of the edge of the approaching light guide plate

[0018] The principal part of this invention consists of such a configuration, and is used as a back light of a panel, especially a liquid crystal panel. It is desirable to consider as a configuration which is shown further below in this invention.

[0019] 1) Shape [of a dot], i.e., although punctiform formation is carried out, **** which especially the configuration of this dot is not restricted and be formed by circular, the square shape, and the crossover line is sufficient as the optical diffusate given to the light guide plate of this invention. Although these are given on the intersection (grid) of the orthotomic with the fixed spacing supposed on a light guide plate, the spacing of an orthotomic is suitably chosen between 0.8-2mm still preferably 0.5-3mm according to the thickness of a light guide plate.

[0020] furthermore, the covering status of the aforementioned optical diffusate -- a surface-of-light-guard-plate top -- a line -- near the light source section, it is desirable that a coverage is 20% - 100% in 1% - 50% and the light source to the maximum ****, and the distance from the light source serves as size -- alike -- taking -- the line from the light source -- it is desirable to cover so that a coverage may serve as size one by one starting with the covering point of the 1 side-face edge which the light source was made to approach moreover, the line of a light guide plate -- the coverage and EQC of the light source -- or it may be made to decrease and you may cover [till then / this coverage / near the opposite-side edge] The coverage said here means the rate of the covering-surface product of the light-scattering matter given to per unit area of a surface of light-guard plate.

[0021] 2) In this invention, still preferably the above mentioned increase in the coverage (Y) of an optical diffusate a line -- it increases so that it may go into the 1.7-3.5th domains to the distance (X) from the light source to the optical diffusate on each grid -- Namely, the line shown by Y=aX1.7 when an axis of ordinate is set as Y and a quadrature axis is set as X and Y=aX3.5 (a is the value calculated from the coverage of the edge of a surface of light-guard plate here) 0< a<=2 -- it is -- it is the thing to increase with the value which enters between the lines shown, or increasing in relation with Y=ax (a's being the value similarly calculated with having described above, and being 1< a<=2)

[0022] 3) further -- this invention -- a photogenesis side top -- a line -- the coverage of the optical diffusate covered on the grid of the status become parallel to the shaft of the light source -- the center on the parallel lines (namely, a line -- the line from the center of the longitudinal direction of the light source -- it is desirable to cover to the distance to the optical diffusate of orientation which goes to ends from the line on the surface of light-guard plate stood at right angles to the light source, so that it may become size one by one) this invention installs optical display panels, such as a liquid crystal panel, in the top of the Idemitsu side, and is used for it.

[0023]

[Effect of the invention] this invention can be comparatively small, and can obtain sufficient brightness, and a power consumption-brightness conversion efficiency can use it as a size back light to the orientation of a normal taken down to the Idemitsu side.

[0024]

[Example] Next, this invention is further explained in full detail in the example of a comparison, and the example. At the edge of the short hand of a rectangle light guide plate (225mmx127mm) with a thickness of 2.0mm, the cold cathode fluorescence spool (normal spool by Harrison electrical machinery incorporated company) of a size with a diameter of 4.8mm has been arranged, it is what laminated the optical diffusion film in the internal surface of parietal bone of a telescopic aluminum reflector which has a 2mm slit in the fraction which touches a light guide plate, and covered, and it has arranged so that the light which acted as Idemitsu from the slit may carry out ON On the other hand, the optical diffusate (coating containing a silica)

covered on a surface of light-guard plate screen-stenciled the circular dot pattern, and it was created on condition that the following and used for it. It plotted so that it might become the value which the coverage of an optical diffusate increased 7% on the minimum point, and increased such proportion by one by one in the interval 80% on the greatest point.

[0025] Furthermore, the film which becomes the Idemitsu side side of a light guide plate from a polycarbonate with a thickness [which made the Idemitsu side the split face rather than ON **** (light guide plate side) by embossing] of about 200 micrometers has been arranged one sheet. The distance of the adjacent concave and concave with the as horizontal level difference of the concave and the convex which the orientation of a normal taken down to the Idemitsu side adjoined about the irregularity of the Idemitsu side when observing the aforementioned film under a microscope 100 times the scale factor of this as 10 micrometers - 100 micrometers and the Idemitsu side or a convex, and a convex was 10 micrometers - 800 micrometers.

[0026] Moreover, it is JIS about the granularity of the front face (split face) of the aforementioned film. It measured based on B0601. That is, it measured on condition that 0.3mm/second in one 50 times the record lateral magnification [500 times as many record longitudinal magnification as this and] of this, and drive speed, and 5micro mR diamond of sensing-pin nose of cams. For the result, the maximum height (Rmax) of a split face was [60 micrometers and the center line average of roughness height (Ra) of 85 micrometers and the ten point average of roughness height (Rz)] 13 micrometers. Rmax was [7 micrometers and Ra of 12 micrometers and Rz] 1 micrometer as a result of measuring similarly the granularity of the field which is not a split face of the aforementioned film on condition that 0.3mm/second in one 50 times the record lateral magnification [2000 times as many record longitudinal magnification as this and] of this, and drive speed, and 5micro mR diamond of sensing-pin nose of cams.

[0027] When the field brightness at the time of applying the alternation voltage of 30kHz to a cold cathode tube, and making it drive with a fixed current from an inverter was measured to the orientation of a normal taken down to two angles of visibility and the Idemitsu side by the luminance meter (TOPCON BM-7) in 40cm of the distance from the Idemitsu side to a luminance meter, it was 211 cds/m2 (example 1).

[0028] moreover, the equipment same except having arranged the usual optical diffusion film (the Tsujimoto electrical machinery factory D-204) which has not carried out embossing between the films and light guide plates which were made into the split face by the aforementioned embossing as an example 1, conditions, and the brightness operated [it came out of and] and measured were 210 cds/m2 (example 2)

[0029] Rmax was [9 micrometers and Ra of 13 micrometers and Rz] 1 micrometer as a result of measuring similarly the granularity of the front face of the optical diffusion film of an example 2 on condition that 0.3mm/second in one 50 times the record lateral magnification [2000 times as many record longitudinal magnification as this and] of this, and drive speed, and 5micro mR diamond of sensing-pin nose of cams. Furthermore, the brightness which operated on the same equipment as an example 1 and conditions, and was measured to the Idemitsu side side of a light guide plate except having arranged the same film in piles two sheets with having used in the example 1 which made the Idemitsu side the split face rather than ON **** (light guide plate side) was 227 cds/m2 (example 3). the equipment same except having arranged the aforementioned optical diffusion film (the Tsujimoto electrical machinery factory D-204) one sheet instead of the film made into the split face by embossing at the Idemitsu side side of a light guide plate as an example 1, conditions, and the brightness operated [it came out of and] and measured were 182 cds/m2 (example 1 of a comparison) moreover, the equipment same except having faced the Idemitsu side side of a light guide plate in the split-face side, and having arranged the film made into the split face by embossing used in the example 1, as the aforementioned example 1, conditions, and the brightness operated [it came out of and] and measured were 176 cds/m2 (example 2 of a comparison) moreover, the equipment same except having arranged the optical diffusion film (the Tsujimoto electrical machinery factory D-204) used in the example 2 between the film and the light guide plate in the example 2 of a comparison as an example 1, conditions, and the brightness operated [it came out of and] and measured were 174 cds/m2 (example 3 of a comparison) furthermore, the equipment same except having arranged in piles only the optical diffusion film (the Tsujimoto electrical machinery factory D-204) used for the Idemitsu side side of a light guide plate in the example 2 two sheets

as the aforementioned example 1, conditions, and the brightness operated [it came out of and] and measured were 179 cds/m2 (example 4 of a comparison)

[0030] In order to investigate the luminous-intensity-distribution property of a back light, next, about an example 2, the example 3, the example 1 of a comparison, and the example 4 of a comparison The field brightness at the time of applying the alternation voltage of 30kHz to a cold cathode tube, and making it drive with a fixed current from an inverter by the luminance meter (TOPCON BM-7) with two angles of visibility As shown in drawing 3 , the angle to the orientation of a normal taken down to the Idemitsu side was changed from 0 times to 70 degrees, and the value of the brightness when measuring in 40cm of the distance from the Idemitsu side to a luminance meter was shown in drawing 4 . If the back light of this invention is used, brightness will increase from this drawing, and it turns out that the directivity of light is remarkable.

[An easy explanation of a drawing]

[Drawing 1] The perspective diagram of the back light of one embodiment of this invention

[Drawing 2] The cross section of the back light of one embodiment of this invention

[Drawing 3] The conceptual diagram of the measuring method used by this invention

[Drawing 4] Drawing showing the angular distribution of the degree of outgoing-radiation luminosity of an example 2, the example 3, the example 1 of a comparison, and the example 4 of a comparison

[An explanation of a sign]

1: Light guide plate

2: The film with which the Idemitsu side consists of a translucency material of a split face rather than ON **** (light guide plate side)

3: A specular reflection plate or optical diffusion ****

4: a line -- the light source

5: Light-reflex machine

6: An optical diffusate

7: The back light of one embodiment of this invention

8: Luminance meter

9: The angle to the orientation of a normal taken down to the Idemitsu side

Fig.1

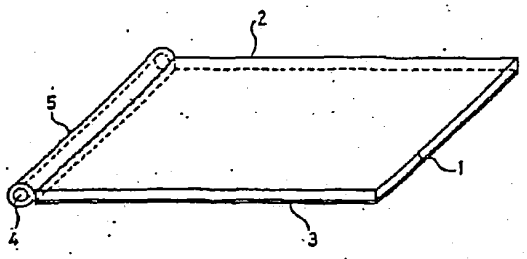


Fig.2

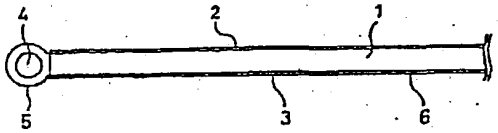


Fig.3

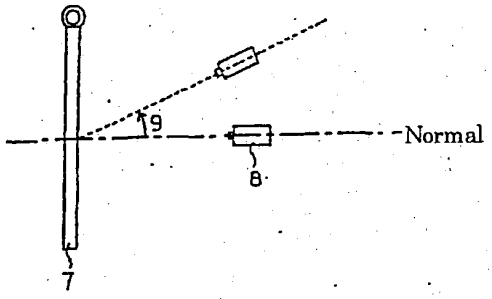
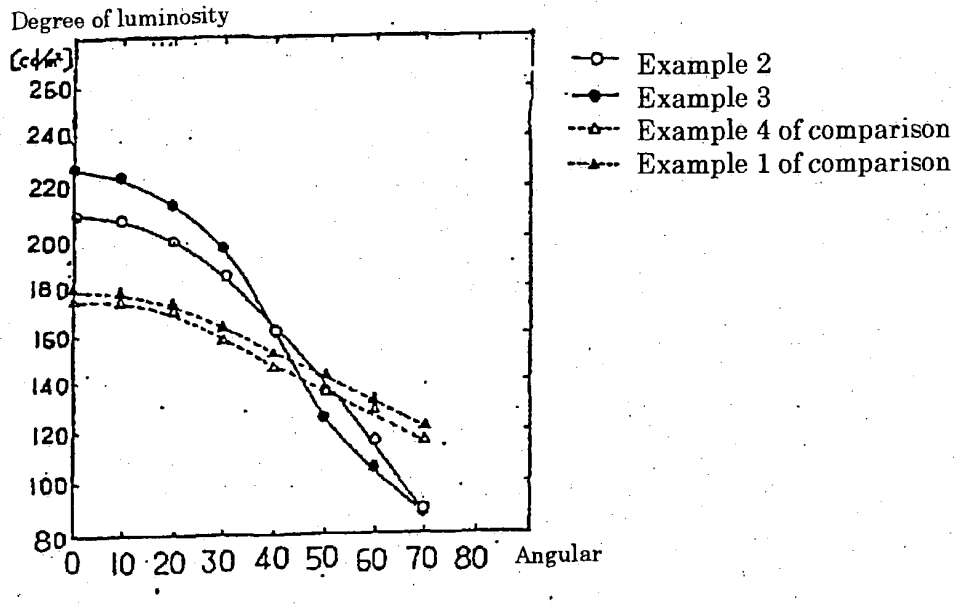


Fig.4



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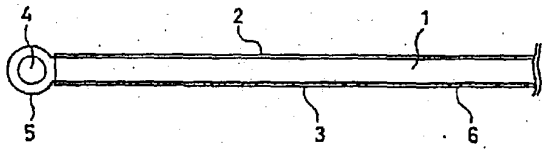
(54)【発明の名称】　バックライト

(57)【要約】

【構成】透光性材料からなる導光板の一方の広い面に光拡散物質を部分的に被覆し、その面を光拡散反射板で覆ったエッジライト型バックライトで、導光板の出光面側に、出光面が入光面（導光板側）よりも粗面であり、これを導光板の出光面側に配した際、導光板の出光面から出る光の輝度を増加させるフィルムを導光板の出光面側に配置したパネル用バックライト。

【効果】このバックライトは充分な輝度が得られ、少なくとも出光面に降した法線方向に対しては消費電力－輝度変換効率が高い高性能機として使用できる。



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【特許請求の範囲】

【請求項１】透光性材料からなる導光板の一方の広い面に、導光板材質の光屈折率以下の屈折率値を持つ光拡散物質を部分的に被覆するか又は同面に光拡散機能を施し、その面を鏡面ないし光拡散反射板で覆い、前記導光板の少なくとも一側面端部にこれに近接した線状光源を有するバネル用バックライトに於いて、導光板の出光面側に、少なくとも１枚の、出光面が入光面（導光板側）よりも粗面の透光性材料からなるフィルムを配したバネル用バックライト。

【請求項２】透光性材料からなるフィルムの出光面側の表面が入光面側（導光板側）の表面より粗面であり、かつ、これを導光板の出光面側に配した際、導光板の出光面から出る光の輝度を、実質的に前記フィルムの出光面側に降ろした法線方向から測定した場合、増加させるフィルムを用いる請求項１記載のバネル用バックライト。

【請求項３】透光性材料からなるフィルムの出光面の粗面の状態が、凹凸状態で構成されており、その面を倍率１００倍の顕微鏡で観察した際に、凹と凸との段差、隣り合った凹と凹、又は凸と凸の距離が１０μｍ～１０００μｍの範囲のフィルムを用いる請求項１又は２記載のバネル用バックライト。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、透過型又は、半透過型バネルを背面より照射するバネル用バックライトに関する。

【０００２】

【従来の技術】近時、ラップトップ型又は、ブック型のワードプロセッサーやコンピュータ等の表示装置として、薄型でしかも見易いバックライト機構を有する液晶表示装置が用いられている。このようなバックライトには、図１に示すように透光性の導光板の一端部に、蛍光管のような線状光源を併設するエッジライト方式がよく用いられる。このエッジライト方式の場合、図２に示すように、導光板の一方の面にこの導光板材料よりも屈折率が大きい光拡散物質を部分的に被覆し、その面のほぼ全面を鏡面反射板又は光拡散反射板で覆うように配置されたものが多い。

【０００３】特に近時、バックライトがバッテリー駆動されるようになり消費電力－輝度変換効率のより一層の向上が望まれおり、線状光源を覆う光反射器に反射率の高い反射板を配したり、導光板の光拡散物質を部分的に被覆した面に反射率の高い反射板を配したりすることが提案されている。

【０００４】しかし、前記したいづれの方法においても、消費電力－輝度変換効率は向上するものの、未だ充分でなく、更により一層の向上が望まれている。

【０００５】

【発明が解決しようとする課題】本発明の目的は、消費電力－輝度変換効率が高く、かつ高輝度が得られるバックライトを提供することにある。

2

【０００６】

【課題を解決するための手段】本発明者等は、上述の点につき種々の検討を行った結果、エッジライト方式のバックライトにおいて、導光板の出光面に少なくとも１枚の出光面が入光面（導光板側）よりも粗面の透光性材料からなるフィルムを配すると、バックライトの配光特性が変化し、出光面に降ろした法線方向に対する光の指向性がより強くなり、実質的に出光面に降ろした法線方向に対しては前記した消費電力－輝度変換効率の高いバックライトとなることを見出した。

【０００７】即ち本発明は、透光性材料からなる導光板の一方の広い面に、該導光板材料の光屈折率以下の屈折率値を持つ光拡散物質を部分的に被覆し、又は同面に光拡散機能を施し、その面を鏡面ないし光拡散反射板で覆い、前記導光板の少なくとも一側面端部にこれに近接した線状光源を有するバネル用バックライトに於いて、導光板の出光面側に、少なくとも１枚の、出光面が入光面（導光板側）よりも粗面の透光性材料からなるフィルムを配したバネル用バックライトに関するものである。

【０００８】次に本発明を図面に基づいて更に詳述する。

【０００９】図１は、本発明の一実施態様の斜視図であり、図２は、エッジライト方式のバックライトの一例を示す図である。図中１は導光板であり、光を効率よく通過させる物質であればよく、石英、ガラス、透光性の天然又は合成樹脂、例えばアクリル系樹脂等である。２は出光面が入光面（導光板側）よりも粗面の透光性材料からなるフィルムで、導光板面より出光した光の配光特性を変化させ、出光面に降ろした法線方向に対する指向性をより強くさせるものである。本発明では、このフィルムを一枚又は複数枚用いるが、本発明の実施例からも判るように、複数枚例えば２枚用いた場合輝度は更に向上する。

【００１０】本発明は、導光板の出光面に、上記の出光面が入光面（導光板側）よりも粗面の透光性材料からなるフィルムを配置することが特徴である。

【００１１】本発明における前記条件を更に詳述すると、前記したフィルム（図中２）は出光面が入光面（導光板側）よりも粗面の透光性材料からなるものでありその材質はアクリル、ポリカーボネイト、ガラス等の透光性材料であればよくその材質は特に限定されない。また、出光面を粗面とする際の粗面形成方法は特に限定されるものではなく、例えばエンボス加工、サンドブラスト加工、熱プレスによる金型成型加工、化学処理等の方法で粗面としたものであり、入光面（導光板側）は特に意識して粗面にする必要はないが、結果として前記出光面が入光面（導光板側）よりも粗面となる状態であれば良い。

【００１２】本発明に於いて、前記粗面となる状態は、例えば、ＪＩＳ　Ｂ０６０１に規定された方法で測定した結果、例えば同規定で言う、１０点平均粗さ、中心線平均粗さ等から判断することができる。

【００１３】本発明に於いて用いる透光性材料からなるフィルムの出光面側の粗面の状態は特に限定されず又その形状は特に規則正しくする必要はない。しかし、そのおおよその目安は、例えば、倍率１００倍の顕微鏡で前記フィルムの出光面側の粗面状態を観察したとき、その面が凹凸状態で構成されており、出光面に降した法線方向の隣り合った凹と凸との段差、又は出光面と水平方向の隣り合った凹と凹又は凸と凸の距離が１０μｍ～１０００μｍの範囲であることが好ましい状態である。本発明で用いる前記フィルムの出光面側の粗面の状態を別の表現で更に説明すると、同フィルムの任意の断面に於いて、出光面側が、凸状の形態、例えばプリズム状又は凸レンズ状の類似した三角錘状の形状で構成されており、その形状の頂角が４０～１７０度、好ましくは８０～１５０度である。

【００１４】液晶ディスプレイは、その表示面に降した法線方向から視認する角度が大きくなる程コントラストが低くなるため、実用上、前記法線方向近傍での輝度が重視される。本発明で、前記したように、出光面側が入光面側より粗面であるフィルムを導光板の出光面に配すると、導光板より出光する光の輝度が増幅され、又、光の指向性がより強化される。即ち、実質的に出光面に降ろした法線方向でその面より出光した光の輝度を測定した場合、前記フィルムを配さない場合、又は出光面側が入光面側より粗面でないフィルムを配した場合に比較して、輝度が増幅されること、前記出光面に降ろした法線に対してある角度、例えば６０度、の方向から同様に測定した輝度が、実質的に法線方向で測定した時の輝度よりその減少割合が大となる（例えば、法線方向で測定した時の輝度のほぼ５０～６０％まで減少する）こと等から、前記した光の指向性がより強化されていることが判る。尚、ここで用いる輝度計は通常一般に用いられる市販の輝度計である。

【００１５】又、後述する導光板面上に印刷されたドット状の光拡散物質（図中６）のドット状のパターンが人間の眼では識別できなくなるように、必要に応じて、前記フィルムと前記導光板との間に光拡散板を配置しても良い。

【００１６】導光板に施す光拡散物質は、導光板の材質に比較して等しいか小さい屈折率を持ち、かつ拡散反射率が大きい顔料、例えばシリカ、硫酸バリウムを含んだ塗料、印刷インキ等である。これらをスクリーン印刷等の方法で導光板面上にドット状に印刷する。更に導光板の表面に直接小孔をあけるなどして光拡散機能を施したものが用いられる。鏡面ないし光拡散反射板（図中３）は光拡散物質を被覆した導光板の面のほぼ全面を覆うように配置する。４は線状光源で、好ましい態様としては、導光板の端部に光が入光するための間隙（スリット）を有する光反射器５で、線状光源の光源面とある幅の間隙をもたせた状態で覆われており、導光板の少なくとも一端面部に近接してその中心軸が導光板の端面とほぼ平行となるように設置される。

【００１７】前記線状光源は、蛍光管、タングステン白熱管、オプティカルロッド、ＬＥＤを配列した物等があるが、蛍光管が好ましく、省電力の面から、電極部を除く均一発光部の長さが、近接する導光板の端部の長さと等しいことが好ましい。

【００１８】本発明の主要部は、このような構成からなり、パネル、特に液晶パネルのバックライトとして使用される。本発明では、更に以下に示すような構成とすることが好ましい。

【００１９】１）本発明の導光板に施す光拡散物質は、ドット状即ち点状形成するものであるが、このドットの形状は特に制限されるものでなく、円形、角形、交差線で形成されたいづれでもよい。これらは導光板上に仮想される一定の間隔を持った直交線の交点（グリッド）上に施されるが、直交線の間隔は０．５～３ｍｍ更に好ましくは０．８～２ｍｍの間で導光板の厚さに応じて適宜選択される。

【００２０】更に、前記光拡散物質の被覆状態は、導光板面上で線状光源部近傍で被覆率が１％～５０％、光源から最遠部で２０％～１００％であることが好ましく、光源からの距離が大となるにつれて、光源から線状光源を近接させた一側面端部の被覆点から始めて被覆率が順次大となるように被覆することが好ましい。又、導光板の、線状光源の反対側端部近傍ではこの被覆率はそれまでの被覆率と同等か又は減少させて被覆してもよい。ここで言う被覆率とは、導光板面の単位面積当たりに施した光散乱物質の被覆面積の割合を言う。

【００２１】２）本発明では、更に好ましくは、前記した光拡散物質の被覆率（Ｙ）の増加は、線状光源から各グリッド上の光拡散物質までの距離（Ｘ）に対して１．７～３．５次の範囲に入るように増加する、即ち、Ｙを縦軸に、Ｘを横軸にした場合、$Y = aX^{1.7}$で示される線と$Y = aX^{3.5}$（ここでａは導光板面の端部の被覆率から求められる値で、$0 < a \leq 2$である）で示される線との間に入る値で増加すること、又は、$Y = a^{x}$（ａは前記したと同じようにして求められる値で、$1 < a \leq 2$である）の関係で増加することである。

【００２２】３）更に、本発明では、発光面上で、線状光源の軸と平行となる状態のグリッド上に被覆される光拡散物質の被覆率が、その平行線上の中央（即ち、線状光源の長手方向の中央から線状光源に垂直に立てた導光板面上の線から両端に向かう方向の光拡散物質までの距離に対して、順次大となるように被覆することが好ましい。本発明は、出光面の上面に液晶パネルなどの光表示

パネルを設置して使用される。

【００２３】

【発明の効果】本発明は比較的小型で、充分な輝度を得られ、出光面に降ろした法線方向に対しては消費電力－輝度変換効率が大なバックライトとして使用できる。

【００２４】

【実施例】次に比較例及び実施例で本発明を更に詳述する。図１に示すような厚さ２．０ｍｍの長方形導光板（２２５ｍｍ×１２７ｍｍ）の短手の端部に、直径４．８ｍｍの太さの冷陰極蛍光管（ハリソン電機株式会社製ノーマル管）を配置し、導光板に接する部分に２ｍｍのスリットを持つ筒型アルミ反射器の内面に光拡散フィルムをラミネートしたもので覆い、スリットから出光した光が導光板の端部から導光板に入光するように配置した。一方、導光板面上に被覆する光拡散物質（シリカを含む塗料）は、円形のドットパターンをスクリーン印刷したものであり下記の条件で作成して用いた。光拡散物質の被覆率が、最小の地点で７％、最大の地点で８０％、その中間ではこれらの比率を順次増加した値となるように作図した。

【００２５】さらに、導光板の出光面側にエンボス加工によって出光面を入光面（導光板側）よりも粗面とした厚さ約２００μｍのポリカーボネイトからなるフィルムを１枚配置した。前記フィルムを倍率１００倍の顕微鏡で観察したときの出光面の凹凸について、出光面に降ろした法線方向の隣り合った凹と凸との段差は１０μｍ～１００μｍ、出光面と水平方向の隣り合った凹と凹、又は凸と凸の距離は１０μｍ～８００μｍだった。

【００２６】又、前記フィルムの表面（粗面）の粗さをＪＩＳ　Ｂ０６０１に準拠して測定した。即ち、記録縦倍率５００倍、記録横倍率５０倍、駆動速度０．３ｍｍ／秒、触針先端５μｍＲダイヤモンドの条件で測定した。結果は、粗面の最大高さ（Ｒｍａｘ）は８５μｍ、１０点平均粗さ（Ｒｚ）は６０μｍ、中心線平均粗さ（Ｒａ）は１３μｍであった。同様に、記録縦倍率２０００倍、記録横倍率５０倍、駆動速度０．３ｍｍ／秒、触針先端５μｍＲダイヤモンドの条件で、前記フィルムの粗面でない面の粗さを測定した結果、Ｒｍａｘは１２μｍ、Ｒｚは７μｍ、Ｒａは１μｍであった。

【００２７】冷陰極管に、インバータより３０ＫＨｚの交番電圧をかけて一定電流で駆動させたときの面輝度を、輝度計（トプコンＢＭ－７）により視野角２度、出光面に降ろした法線方向に対して、出光面から輝度計までの距離４０ｃｍで測定したところ２１１ｃｄ／ｍ²であった（実施例１）。

【００２８】又、前記エンボス加工によって粗面としたフィルムと導光板の間に、エンボス加工をしていない通常の光拡散フィルム（辻本電機製作所Ｄ－２０４）を配置した以外は実施例１と同一の装置、条件、で操作し、測定した輝度は２１０ｃｄ／ｍ²であった（実施例２）。

【００２９】実施例２の光拡散フィルムの表面の粗さを、同様に、記録縦倍率２０００倍、記録横倍率５０倍、駆動速度０．３ｍｍ／秒、触針先端５μｍＲダイヤモンドの条件で測定した結果、Ｒｍａｘは１３μｍ、Ｒｚは９μｍ、Ｒａは１μｍであった。更に、導光板の出光面側に、出光面を入光面（導光板側）よりも粗面にした、実施例１で用いたと同様のフィルムを２枚重ねて配置した以外は実施例１と同一の装置、条件で操作し測定した輝度は２２７ｃｄ／ｍ²であった（実施例３）。

導光板の出光面側に、エンボス加工によって粗面としたフィルムの代わりに、前記光拡散フィルム（辻本電機製作所Ｄ－２０４）を１枚配置した以外は実施例１と同一の装置、条件、で操作し、測定した輝度は１８２ｃｄ／ｍ²であった（比較例１）。又、実施例１で用いたエンボス加工によって粗面としたフィルムを、その粗面側を導光板の出光面側に相対して配置した以外は前記実施例１と同一の装置、条件、で操作し、測定した輝度は１７６ｃｄ／ｍ²であった（比較例２）。又、比較例２に於いてフィルムと導光板の間に、実施例２で用いた光拡散フィルム（辻本電機製作所Ｄ－２０４）を配置した以外は実施例１と同一の装置、条件、で操作し、測定した輝度は１７４ｃｄ／ｍ²であった（比較例３）。更に、導光板の出光面側に、実施例２で用いた光拡散フィルム（辻本電機製作所Ｄ－２０４）のみを２枚重ねて配置した以外は前記実施例１と同一の装置、条件、で操作し、測定した輝度は１７９ｃｄ／ｍ²であった（比較例４）。

【００３０】次に、バックライトの配光特性を調べるために、実施例２、実施例３、比較例１、比較例４について、冷陰極管に、インバータより３０ＫＨｚの交番電圧をかけて一定電流で駆動させたときの面輝度を、輝度計（トプコンＢＭ－７）により視野角２度で、図３に示すように出光面に降ろした法線方向に対しての角度を０度から７０度まで変化させ、出光面から輝度計までの距離４０ｃｍで測定したときの輝度の値を図４に示した。この図から、本発明のバックライトを用いると輝度が増加し、光の指向性が顕著であることが判る。

【図面の簡単な説明】

【図１】本発明の一実施態様のバックライトの斜視図

【図２】本発明の一実施態様のバックライトの断面図

【図３】本発明で用いた測定方法の概念図

【図４】実施例２、実施例３、比較例１、比較例４の出射光輝度の角度分布を示す図

【符号の説明】

１：導光板

２：出光面が入光面（導光板側）よりも粗面の透光性材料からなるフィルム

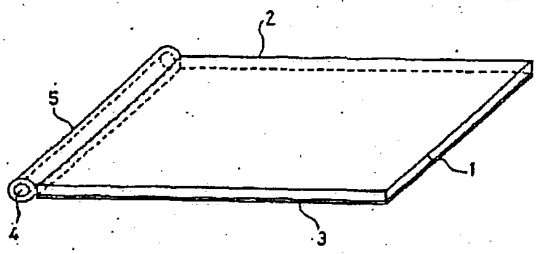
３：鏡面反射板又は光拡散射板

４：線状光源

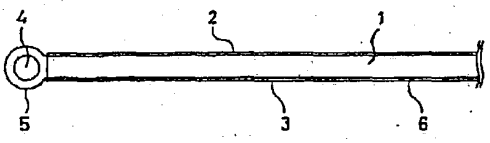
7　　8

5：光反射器
6：光拡散物質
7：本発明の一実施態様のバックライト
＊８：輝度計
９：出光面に降ろした法線方向に対しての角度
＊

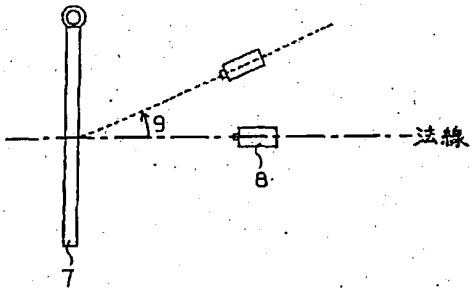
【図１】



【図２】



【図３】



【図４】